Hall Ticket Number:

Code No. : 16339 O

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

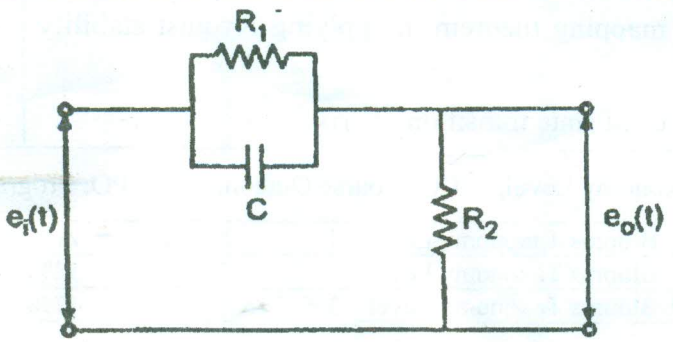
B.E. (E.E.E.) VI-Semester Backlog Examinations, July-2022

Linear Control Systems

Time: **3 hours** Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10× 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Distinguish between AC servo motor and 3 Phase Induction motor.	2	1	1	1,2
2.	Define type and order of control system and Identify the type and order of the following transfer function $G(s) = \frac{s+2}{s^3(s^2+4s+5)}$	2	3	1	1,2
3.	The roots of a characteristic equation are on the imaginary axis. What type of damping does the system exhibits?	2	1	2	1,2
4.	State R-H stability criterion	2	1	2	1,2
5.	Draw the Bode plot of the factor 1/s.	2	2	3	1,2
6.	Evaluate the resonant peak of the system represented by the transfer function $G(s) = \frac{1}{s^2+4s+16}$	2	3	3	1,2
7.	Write the condition to evaluate the stability of system using Nyquist criterion and explain all the terms in the equation.	2	2	4	1,2
8.	Define the terms Gain Margin and Phase margin.	2	1	4	1,2
9.	Enumerate the advantages of state space representation.	2	2	5	1,2
10.	What are the minimum number of state variables required for a system of 5^{th} order?	2	2	5	1,2
	Part-B (5×8 = 40 Marks)				
11. a)	Differentiate between open loop and closed loop system.	4	2	1	1,2
b)	Obtain the transfer function of the lead network shown in figure 	4	3	1	1,2

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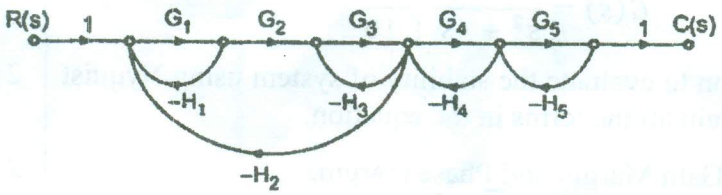
12. a)	Define the three error coefficients and show the effect of three error coefficients on steady state error.	4	1	2	1,2
b)	Consider the unity feedback control system whose open loop transfer function is $G(s) = \frac{50}{s(1+0.1s)}$. Determine time response specifications of the system.	4	3	2	1,2
13.	A unity feedback system has $G(s) = \frac{80}{s(s+2)(s+20)}$. Sketch the Bode plot and comment on the stability of the system/	8	3	3	1,2
14. a)	For feedback control system $G(s)H(s) = \frac{40}{(s+2)(s^2+2s+2)}$. Determine the stability of system from Nyquist plot.	5	3	4	1,2
b)	Draw the polar plot of the transfer function $G(s)H(s) = \frac{12}{s(s+2)(s+1)}$	3	3	4	1,2
15. a)	Obtain the solution of state equation through Laplace transform method.	4	2	5	1,2
b)	Derive the state space model of the transfer function $T(s) = \frac{2}{s^3+s^2+2s+3}$	4	3	5	1,2
16. a)	Find C(s)/R(s) for the system shown in figure using Mason's Gain formula. 	4	3	1	1,2
b)	For a unity feedback system $G(s) = \frac{K}{s(s+4)(s+2)}$. Determine the centroid, break away points, the value of K for which the system is marginally stable.	4	3	2	1,2
17.	Answer any ***two*** of the following:				
a)	What are compensators? Discuss the steps involved in design of lead compensator.	4	1	3	1,2
b)	Explain the use of mapping theorem in applying Nyquist stability criterion.	4	2	4	1,2
c)	Discuss the properties of state transition matrix.	4	2	5	1,2

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	21%
ii)	Blooms Taxonomy Level – 2	32%
iii)	Blooms Taxonomy Level – 3 & 4	47%

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